Muxless Switchable Graphics Technology PX5.0 Functional Specification

Technical Reference Manual

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1

Introduction

1.1 Overview

This document describes the system behavior of Muxless Switchable Graphics technology PX5.0 along with general platform hardware and system BIOS requirements.

1.2 Scope

Switchable Graphics technology is a platform feature that applies to systems equipped with a discrete graphics processor unit (dGPU) and an integrated graphics processor unit (fGPU/iGPU), which is designed to allow the system to switch between GPUs (graphics processor units) in order to help achieve designed performance or power savings.

AMD now introduces Muxless Switchable Graphics technology PX5.0, which enhances the dynamic scheme of PX4.0 with a number of new features.

Please refer to the *Muxless ATI™ Switchable Graphics Technology PX4.0 Functional Specification* for a detail description of PX4.0.

This document provides the functional description of Muxless Switchable Graphics technology PX5.0, interfaces, and requirements.

1.3 Acronyms/Abbreviations

Acronym or Abbreviation	Definition
A + A	Platforms with AMD Fusion graphics and AMD discrete graphics.
A + I	Platforms with AMD discrete graphics and Intel integrated graphics.
ACPI	Acronym for “Advanced Configuration and Power Interface.”
ADL	Acronym for “AMD Driver Library.”
ATPX	AMD proprietary ACPI method for switchable graphics platforms.
BACO	Acronym for “Bus Alive Chip Off.” A low-power inactive graphics-device state where the bus interface is powered on, and the PCI configuration space is exposed to the operating system.
CCC	Acronym for “Catalyst™ Control Center.”
dGPU	Acronym for “Discrete Graphics Processor Unit.”
Dynamic-zero	Internal codename for the technology to turn off the dGPU when the dGPU is idle.
fGPU	Acronym for “AMD Fusion Graphics Processor Unit.”

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Acronym or Abbreviation	Definition
GPU	Acronym for “Graphics Processor Unit.”
iGPU	Acronym for “Integrated Graphics Processor Unit.”
Integrated Graphics	A graphics device integrated with the Northbridge or CPU.
LDA	Acronym for “Linked Adapter Mode.” A mode determined at driver load where one adapter with its displays is exposed to applications, but rendering can be done on multiple adapters.
Muxless PX	AMD PowerXpress™ with no display output multiplexers.
PX/SG	Acronym for “AMD PowerXpress/Switchable Graphics.”
SBIOS	Acronym for “System BIOS.”
UI	Acronym for “User Interface.”
VBIOS	Acronym for “Video BIOS.”

1.4 Feature Compatibility with Platforms

Platform Codename	OpenGL on the dGPU under the Dynamic Scheme	OpenCL™ on the dGPU under the Dynamic Scheme	Extended Battery Mode under the Dynamic Scheme	OEM PX Application Profile	BACO under the Dynamic Scheme	Dynamic-zero under the Dynamic Scheme	Fixed Scheme
AMD “Comal”	Yes	Yes	Yes	Yes	Yes	Yes	No
AMD “Sabine,” AMD “Brazos”	No	Yes	No	No	Yes	No	Yes
Intel Chief River	Yes	Yes	Yes	Yes	Yes	Yes	No
Intel Huron River (New Designs)	Yes	Yes	Yes	Yes	Yes	Yes	No
Intel Huron River (Existing Designs)	No	Yes	No	No	Yes	No	Yes

1.5 References

- *ACPI Control Methods and Notifications*, revision 0.28 or later.
- *Switchable Graphics ACPI Control Methods*, revision 0.26 or later.
- *AMD PowerXpress ACPI Control Methods*, revision 0.26A or later.
- *Muxless ATI™ Switchable Graphics PX3.0 Functional Specification*, (48456_mlsgpx3_spec_nda_30).
- *Muxless ATI Switchable Graphics PX4.0 Functional Specification, (48551_mlsgpx4_spec_nda).*
- AMD Driver Library (ADL) documentation.

Note: Contact your local AMD technical representative for the latest document revisions.

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1.6 Supported Operating Systems

Windows® 7 (32-bit and 64-bit)

1.7 Supported ASICs

1.7.1 GPU ASICs

- “Seymour”
- “Thames”
- “Chelsea”
- “Heathrow”
- “Wimbledon”

1.7.2 AIO (All-in-one) ASICs

- “Caspian”
- “Onega”
- “Caicos XT”
- “Great Wall”

1.8 Limitations and Restrictions

- No overlay playback from the dGPU under A + A and A + I platform configurations.
- All display outputs are driven by integrated graphics, regardless of whether integrated graphics or discrete graphics perform rendering.
- Windows 7 Starter is not supported on A + A and A + I platform configurations.
- On A + I platforms, PX5.0 is configured to play protected video content on the fGPU/iGPU. The following player applications render the content on the fGPU/iGPU regardless of application profile settings:
  a. wmplayer.exe
  b. ehshell.exe
  c. moviemaker.exe
  d. PowerDVD*.exe
  e. WinDVD.exe

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- BD (Blu-ray disc) playback will fail on a high-performance GPU if Aero is OFF on A + A and A + I platform configurations.
- DVD playback with 2D to 3D video conversion does not work on high-performance GPUs in A + A and A + I configurations.
- For A + A platform configurations, PowerPlay™ setting changes for high-performance GPUs and for the IGP need to be done separately through the Windows Power Plan UI.

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2

Functional Description

2.1 Fixed Switchable Graphics Scheme

The fixed scheme will not be supported on Intel Chief River platforms, AMD "Comal" platforms, as well as future platforms that follow them. On 2011 designs, such as Intel Huron River platforms and AMD "Sabine" platforms, the fixed scheme and scheme switching between dynamic and fixed remain unchanged from PX4.0.

For a detailed functional description of PX4.0, please refer to the *Muxless ATI™ Switchable Graphics PX4.0 Functional Specification* for Intel platforms and *AMD Platform Switchable Graphics and Dual Graphics Design Guidance and Functional Specification*, revision 1.5, for AMD platforms.

2.1.1 Hardware Requirement

On designs where the fixed scheme is supported, dGPU power-down hardware implementation is required.

Details are found in dGPU Power-down Implementation (for the Dynamic-zero or the Fixed Scheme).

2.1.2 SBIOS Requirement

- Bit 9 in SBIOS ATPX function 1 (Get AMD PowerXpress™ Parameters) is used to indicate whether the fixed scheme is supported on the platform.
- On designs where the fixed scheme is not supported, bit 9 must be set to 1.

For SBIOS ATPX function descriptions, please refer to *Switchable Graphics ACPI Control Methods*, revision 0.26, for Intel platforms and *AMD PowerXpress ACPI Control Methods*, revision 0.26A, for AMD platforms.

Details are found in SBIOS Requirements.

2.2 Dynamic Switchable Graphics Scheme

Under the dynamic mode, the user does not directly control which graphics device is active. The render-graphics device is determined by application profile settings and the default rule.

- Displays are always exposed to the OS through integrated graphics.
- Aero desktop always runs on integrated graphics.

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- 3D, OpenGL, and video-playback applications run on the fGPU/iGPU or dGPU depending on the application profile.
- If an application does not have a profile, the application runs on the default rendering GPU.
- The end-user can edit application profiles.
- When the last application rendering on the dGPU ends, the dGPU is fully powered off on PX5.0 designs or put into BACO mode on PX4.0 designs.

Muxless Switchable Graphics technology PX5.0 includes the following capabilities under the dynamic mode.

- dGPU power-off
- Extended battery mode
- OEM specific PX application profiles
- OpenGL support on the dGPU
- OpenCL™ support on the dGPU
- Various integrated graphics vendor components installation

2.2.1 dGPU Power-Off

PX5.0 introduces Dynamic-zero technology in addition to BACO (Bus Alive Chip Off). Dynamic-zero allows the system to turn off the dGPU when the dGPU is idle.

BACO functionality can still be enabled for PX4.0 compliance, but is not necessary for PX5.0-only enabled systems.

On designs where both dGPU power-off and BACO mode are enabled, dGPU power-off takes precedence over BACO.

When the last application that is rendering on the dGPU ends, the dGPU will be powered off by Dynamic-zero technology.

2.2.1.1 Hardware Requirement

- In order to turn off the dGPU, dGPU power-down hardware implementation is required.
- On designs where BACO functionality is required, BACO hardware circuitry needs to be implemented.

Details are found in dGPU Power-down Implementation (for the Dynamic-zero or the Fixed Scheme).

2.2.1.2 SBIOS Requirement

- SBIOS ATPX function 2 (Power Control) is required to fully power off the dGPU under the dynamic scheme.
- Bit 7 in SBIOS ATPX function 1 (Get AMD PowerXpress Parameters) is used to indicate whether the dynamic scheme is supported on the platform. Setting it to 1 indicates that the dynamic scheme is supported.

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- Bit 10 in SBIOS ATPX function 1 is used to indicate whether Dynamic-zero is supported on the platform. Setting it to 1 indicates that Dynamic-zero is supported.
- On designs where BACO functionality is required, the SBIOS has to enable PCIe® Gen1 that is required to support BACO mode, else the dGPU cannot enter into BACO mode.

Please refer to *Switchable Graphics ACPI Control Methods*, revision 0.26, for the SBIOS ATPX function description on Intel platforms and *AMD PowerXpress ACPI Control Methods*, revision 0.26A, for the SBIOS ATPX function description on AMD platforms.

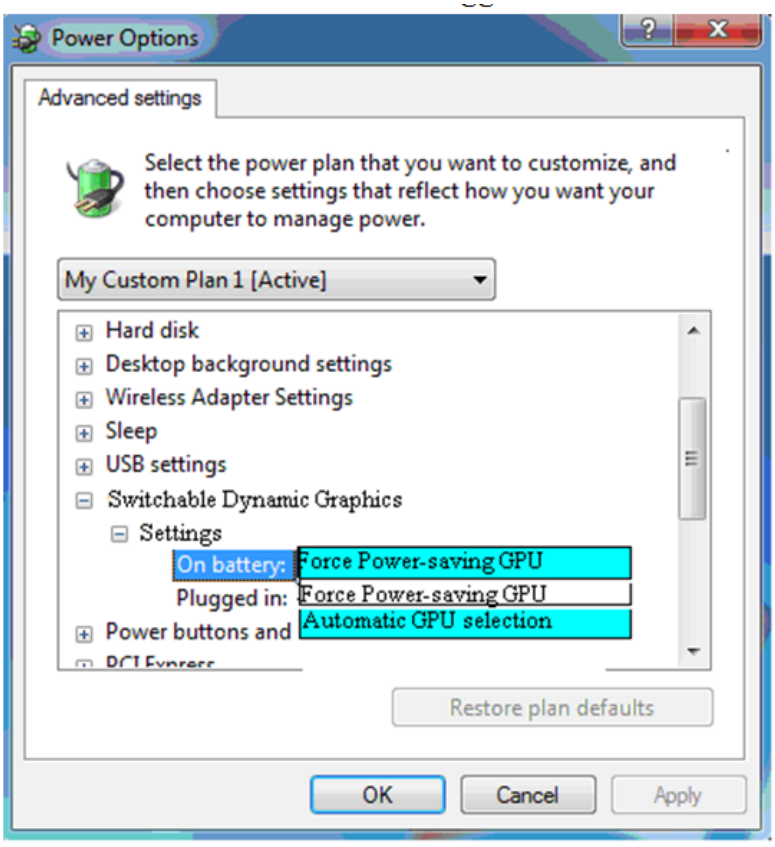
The details are described in SBIOS Requirements.

2.2.2 Extended Battery Mode

The extended battery mode provides a way to force an application rendering on the fGPU/iGPU, bypassing GPU affinity as set in the application profile. It can be selected by the following two options. A packaging option is used to choose one of the two options.

1. An OEM application that calls ADL functions to set/reset extended battery mode.
2. User Power Plan selection for **Plugged in** and/or **On battery** as shown in the following figure.

Figure 2–1 Power Plan



The default settings are:

- Power Saving Plan:
  - On Battery—Automatic GPU selection
  - Plugged-in—Automatic GPU selection
- Balanced Plan:
  - On Battery—Automatic GPU selection
  - Plugged-in—Automatic GPU selection
- Performance Plan:
  - On Battery—Automatic GPU selection
  - Plugged-in—Automatic GPU selection

Note: The user must change the **On battery** Power Plan setting to **Force Power-saving GPU** to enable extended battery mode on a Power Plan switch.

Direct 3D and OpenGL applications that start after extended battery mode is enabled will be forced to render on a power-saving GPU. Enabling or disabling extended battery mode will not affect the running applications.

2.2.3 OEM Specific PX Application Profiles

The introduction of OEM specific PX application profiles will enable OEMs to set their application profiles that can be different from the system (AMD default) application profiles.

There are three sets of PX application profiles: 1) user, 2) OEM, and 3) system (AMD default). The user application profile settings take precedence over OEM settings, and OEM settings take precedence over system settings. Only the highest precedence application profile is visible to the end-user.

This section outlines the steps that have to be executed in order to deploy OEM specific PX application profiles.

2.2.3.1 Creating OEM XML with PX Application Profile Data

Details:

The following figure shows an OEM XML file that runs application1.exe on a high-performance GPU, application2.exe on a power-saving GPU, and application3.exe on the default GPU.

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Figure 2–2 OEM XML File

```
<?xml version="1.0" encoding="utf-16"?>

<customisations Format="0">

<applications>

        <application Title="description of application1" File="application1.exe">

<use Area="PXDynamic">HighPerfGPUAffinity</use>

</application>

        <application Title="description of application2" File="application2.exe">

<use Area="PXDynamic">PowerSavGPUAffinity</use>

</application>

        <application Title="description of application3" File="application3.exe">

<use Area="PXDynamic">DefaultGPUAffinity</use>

</application>

</applications>

</customisations>
```

Please create an OEM XML file with a PX application profile data.

1. Each application should be represented by an application XML element.
2. Set the **File** attribute to the executable name of this application.
3. Set the **Title** attribute to the description of the application.
4. Set the data of the use XML element to the GPU that the application will run on.

   HighPerfGPUAffinity, **PowerSavGPUAffinity**, and **DefaultGPUAffinity** are the only options.

2.2.3.2 Generating an OEM Application Profile Blob File

Prerequisites:

This has to be executed on the system that has the AMD switchable graphics driver installed. The version of the AMD switchable graphics driver installed on the system has to correspond to the version of the AMD switchable graphics driver that the application profile blob file will be deployed with.

Details:

The examples in this section assume that the OEM XML file (described in Creating OEM XML with PX Application Profile Data) is named as oemappprofiles.xml, and

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located in C:\OEMXML. It is also assumed that the OEM application profile blob file is created in C:\OEMXML, and named as atiapoem.blb.

1. In the command line, execute:

```
>atiapfxx -oem -s c:\oemxml\oemappprofiles.xml -b c:\oemxml\atiapoem.blb -l
    c:\oemxml\atiapoem.blb -l c:\oemxml\log.txt
```

2. Review the log file, C:\oemxml\log.txt.

   Pay special attention to lines that start with **ERROR:**. They indicate problems with the input XML. The following examples show common errors with instructions of how to fix them.

   - **ERROR, Area <…> referred by the profile is missing in the system blob.**

     The area identifier is misspelled in the use declaration. An example is shown in the following figure.

Figure 2–3 Misspelled Area Identifier

```
<?xml version="1.0" encoding="utf-16"?>

<customisations Format="0">

<applications>

        <application Title="description of application1" File="application1.exe">

<use Area="PXDynam">HighPerfGPUAffinity</use>

</application>

</applications>

</customisations>
```

     Replace **PXDynam** with **PXDynamic** to fix the error.

   - **ERROR, Application <…> use doesn't refer to an existing area <…> profile <…>.**

     The GPU identifier is misspelled. An example is shown in the following figure.

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Figure 2–4 Misspelled GPU Identifier

```
<?xml version="1.0" encoding="utf-16"?>

<customisations Format="0">

<applications>

        <application Title="description of application1" File="application1.exe">

<use Area="PXDynamyc">HighPe</use>

</application>

</applications>

</customisations>
```

Replace **HighPe** with **HighPerfGPUAffinity**, **PowerSavGPUAffinity**, or **DefaultGPUAffinity** to fix the error.

3. Repeat steps 1 and 2 until there is no error in the log file.

2.2.3.3 Creating an Installation Package for Deploying the OEM Application Profile Blob File

Prerequisites:

- InstallShield Professional version 9 or later.
- InstallShield standalone build if you plan to build the installation package from the command line.
- InstallShield template project for deploying the OEM application profile blob file.

  The InstallShield installer template can be obtained from local AMD support teams. It includes the following files:

  - The project .ism file, OEMAppProfiles.ism
  - The OEM .blb file, atiapoem.blb, located in \Bin
  - Other resource files, located in \Resource and \Tables

Details:

The examples in this section assume that the InstallShield template is located in C:\OEMAppProfiles.

It is recommended to use the command line, if the InstallShield standalone build is available, to build the installation package for deploying the OEM application profile blob file. Using InstallShield IDE is an alternative method.

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Note: OEMAppProfiles.ism must be ready, and must be editable.

1. Build the installation package with the command line.
   - Open the command window with the **Run as Administrator** option.
   - Depending on the version of the InstallShield that you are using, type one of the following commands in the command line:

     ```
     IsSaBld.exe -p "C:\OEMAppProfiles\OEMAppProfiles.ism" -a "CD" -r  "compressed"
         -c COMP -e N -b "C:\build\OEMAppProfile\Output"
     ```

     Or

     ```
     "ISCmdBld.exe" -p  "C:\OEMAppProfiles\OEMAppProfiles.ism" -a "CD" -r
         "compressed" -c COMP -e N -b "C:\build\OEMAppProfile\Output"
     ```

     Note: DO NOT copy the command lines from this document, type them in manually.
   - The installation package for deploying the OEM application profile blob file will be generated in C:\build\OEMAppProfile\Output\CD\compressed \DiskImages\DISK1.

     Note: All of the files generated at this location constitute the installation package, and should be shipped together.
2. Build the installation package with InstallShield IDE:
   - Replace the existing C:\OEMAppProfiles\Bin\atiapoem.blb file with the one generated from Generating an OEM Application Profile Blob File.
   - Open the InstallShield template project file, C:\OEMAppProfiles \OEMAppProfiles.ism in InstallShield IDE.
   - Build the installation package:
     - In the toolbar, click **Build**.
     - Or in the main menu, click **Build**, and select **Build Compressed**.
     - Or in the **Project Panel**, under **Media Release**, right-click **Compressed**, and select **Build**.
   - The installation package for deploying the OEM application profile blob file will be generated in C:\OEMAppProfiles\CD\compressed\DiskImages \DISK1.

     Note: All of the files generated at this location constitute the installation package, and should be shipped together.

2.2.3.4 Localizing the Installation Package with Orca.exe

Prerequisites:

- Orca.exe is a tool for editing the Windows® installer package. The Orca installer, Orca.msi, is available in C:\Program Files\ Microsoft SDKs\Windows\V7.0\Bin\ after the installation of Microsoft® Windows SDK is completed.

Microsoft Windows SDK for Windows® 7 can be downloaded from the Microsoft website.

Note: Microsoft Windows SDK installation must be executed through the network.

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Details:

This step is needed to assure that the name of the OEM application profile installation package is displayed with the correct language in the Windows control panel and in the AMD driver installer.

The name of the OEM application profile installation package will be displayed in English only if this step is skipped.

- Open Orca.exe that is usually installed in C:\Program Files\Orca.
- Open the .msi file that was generated in Creating an Installation Package for Deploying the OEM Application Profile Blob File.

  In the Orca dialog box, click **File ▸ Open...** and select OEMAppProfiles.msi in C:\build\OEMAppProfile\Output\CD\compressed\DiskImages\DISK1.
- In the **Tables** menu, click **Import Tables**, and select:

  C:\ OEMAppProfiles\Tables\ATI_Localization_Strings.idt in the displayed File dialog.
- Click **Open**.
- In the **Import** page that appears, click **OK** to merge the ATI_Localization_Strings.idt table.
- Save the changes to the MSI file by clicking **File ▸ Save**.

2.2.3.5 Generating a New Product Code for the OEM Application Profile Installation Package

Prerequisites:

The same as Localizing the Installation Package with Orca.exe.

Details:

The new product code has to be generated for the OEM application profile installation package every time when it is built to deploy a newer version of atiapoem.blb.

- Open Orca.exe that is usually installed in C:\Program Files\Orca.
- Open the .msi file that was generated in Creating an Installation Package for Deploying the OEM Application Profile Blob File.

  In the Orca dialog box, click **File ▸ Open...** and select OEMAppProfiles.msi in C:\build\OEMAppProfile\Output\CD\compressed\DiskImages\DISK1.
- Select **Property** from the list of tables on the left.
- Select **ProductCode** from the **Property** column in the right pane.
- Right-click on the **Value** column, and select **Paste New GUID** from the dialog box.
- Save the changes to the MSI file by clicking **File ▸ Save**.

2.2.3.6 Integrating the OEM Application Profile Installation Package into the AMD Driver Installer

In order to integrate the OEM application profile installation package that was generated in previous steps into the AMD driver installer, the installation package needs to be loaded into the AMD driver build system.

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Please check with AMD support teams for transporting all of the files in C:\build \OEMAppProfile\Output\CD\compressed\DiskImages\DISK1, as shown in the example in OEM Specific PX Application Profiles, to the AMD driver build system.

2.2.4 OpenGL Support on the dGPU

OpenGL applications will run on the fGPU/iGPU or dGPU based on the application profile association.

If there is no application profile associated with the OpenGL application, the application will run on the default GPU that is fGPU/iGPU.

On AMD “Sabine” and “Brazos” platforms, OpenGL applications will run on the APU only, as was the case with PX4.0. This is designed to ensure a consistent user experience with “Sabine” and “Brazos” platforms that may already be in the market.

2.2.5 Support on the dGPU

fGPU/iGPU and dGPU capabilities will be exposed to OpenCL applications. An OpenCL application will decide on which GPU to use.

2.2.6 Various Integrated Graphics Vendor Components Installation

For platforms with a non-AMD iGPU, in addition to the iGPU driver, various components from the integrated graphics vendor are installed by a single PX installation package.

An uninstall of all installed components is done as a full PX package uninstallation from the Windows operating system **Uninstall** or **Change a Program**.

Note: Uninstalling display drivers on a switchable graphics platform from the Windows operating system's **Device Manager** may lead to unexpected behaviors.

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3

Interfaces and Requirements

3.1 OEM Specific PX Application Profiles

The following table outlines the requirements of the platform implementation on PX4.0 and PX5.0 designs.

Details are described in dGPU Power-down Implementation (for the Dynamic-zero or the Fixed Scheme) and BACO Hardware Implementation.

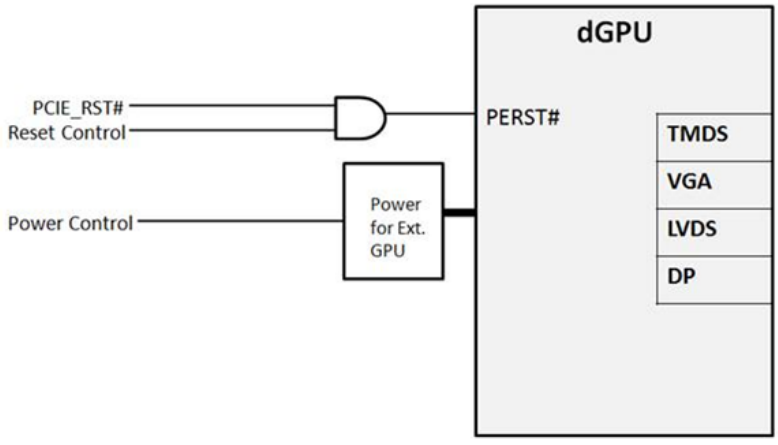
	PX4.0 Design			PX5.0-only Design
	Dynamic Only	**Fixed Only**	**Dynamic and Fixed**	
BACO Hardware Implementation	Required	Not required	Required	Not required*
dGPU Power-down Implementation (for the Dynamic-zero or Fixed Scheme)	Not required	Required	Required	Required
Note: * For AMD "Comal" platforms, please refer to the "Comal" design guidance.				

3.1.1 dGPU Power-down Implementation (for the Dynamic-zero or the Fixed Scheme)

Reset and power control to the dGPU are required to support full dGPU power off.

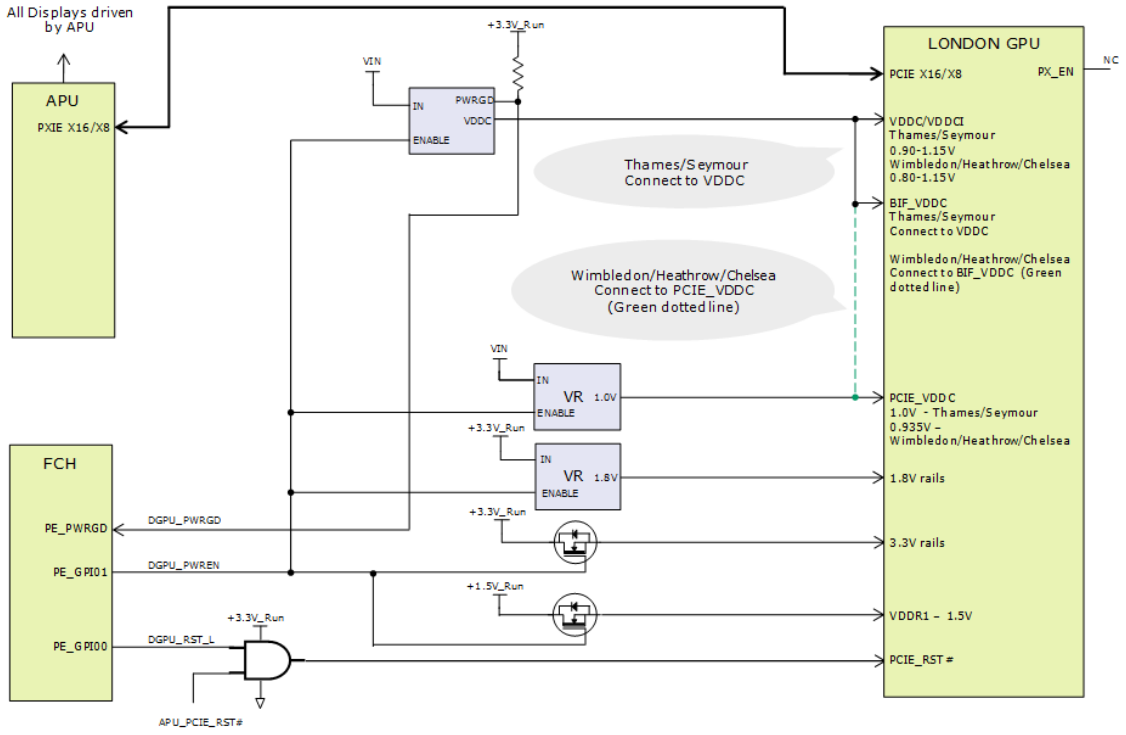
The following figure shows a high-level platform implementation supporting a PX5.0-only design or PX4.0 fixed mode.

Figure 3–1 High-level dGPU Power-down Implementation for Dynamic-zero or Fixed Mode



The following figure shows a sample schematic on AMD platforms supporting a PX5.0-only design or PX4.0 fixed mode. For details, please refer to the AMD “Pumori” schematic.

Figure 3–2 Power-down Sample Schematic on AMD Platforms



3.1.2 BACO Hardware Implementation

BACO hardware implementation is simplified for “Heathrow” and “Chelsea,” and is different from “Thames.”

Please refer to the following documents for BACO hardware implementations:

- *“Heathrow”/“Chelsea”/“Thames” Reference Schematics*, ref140.pdf
- Application Note: *Comparison of BACO Implementation between AMD’s 40-nm Mobile ASICs and 28-nm Mobile ASICs*

3.2 Software Interfaces and Requirements

3.2.1 API for Third Party Applications

The following additional functions are provided in the AMD driver library (ADL). Please refer to the ADL documentation for details.

- Set/reset extended battery mode
- Get extended battery mode

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3.2.2 Integrated Graphics VBIOS and SBIOS Interfaces

Existing interfaces between the SBIOS and VBIOS, and between the display driver and VBIOS are used for the integrated graphics controller.

3.2.3 Discrete Graphics VBIOS and SBIOS Interfaces

Discrete graphics VBIOS and SBIOS interfaces for PX5.0 are the same as in PX4.0.

Please refer to the *Muxless ATI Switchable Graphics PX4.0 Functional Specification* for Intel platforms and *AMD Platform Switchable Graphics and Dual Graphics Design Guidance and Functional Specification*, revision 1.5, for AMD platforms.

Note: On designs where BACO functionality is required, BACO has to be enabled in the dGPU video BIOS.

3.2.4 SBIOS Requirements

The SBIOS has to turn ON both the dGPU and fGPU/iGPU during boot-up and resume from S3 or S4.

3.2.4.1 ATPX Functions

ATPX ControlMethod functions that control the dGPU power and reset are implemented in the SBIOS. These functions will be invoked by the display driver.

The following functions are critical on a switchable graphics design:

- Function 0 (Verify Interface):
  - Required for any switchable graphics design.
- Function 1 (Get AMD PowerXpress™ Parameters):
  - Bits 0 to 6 and 11 to 31 must be set to 0.
  - Bit 7 indicates that a dynamic scheme is supported, if it is set to 1.
  - Bit 9 indicates that a fixed scheme is not supported, if it is set to 1.
  - Bit 10 indicates that a full dGPU power off in a dynamic scheme is supported, if it is set to 1.
- Function 2 (Power Control):
  - Required for the fixed scheme.
  - Required for dGPU power off under the dynamic scheme.

Please refer to *Switchable Graphics ACPI Control Methods*, revision 0.26, for the SBIOS ATPX function description on Intel platforms, and *PowerXpress ACPI Control Methods*, revision 0.26A, for the SBIOS ATPX function description on AMD platforms.

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3.2.4.2 PCIe® Gen1 Enablement

On designs where BACO functionality is required, the SBIOS has to enable PCIe® Gen1 that is required to support BACO; otherwise the dGPU cannot enter into BACO mode.

The following table outlines the requirements of the BIOS.

Table 3–1 BIOS Requirements

	ATPX Function 1	ATPX Function 2	Enable PCIe Gen1 in a SBIOS	Enable BACO in a dGPU VBIOS
Fixed Scheme NOT Supported	Set Bit 9 to 1			
Fixed Scheme Supported	Set Bit 9 to 0	Required		
BACO Mode under the Dynamic Scheme	Set Bit 7 to 1		Required	Required
dGPU Power Off under the Dynamic Scheme	Set Bit 7 to 1 Set Bit 10 to 1	Required		

3.2.5 User interfaces

3.2.5.1 Switchable Graphics Scheme Options

On designs where both fixed and dynamic schemes are supported, the user can select the fixed or dynamic scheme from the scheme switch UI found in Catalyst™ Control Center as shown in the following figures.

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Figure 3–3 Scheme Switch UI on AMD Platforms

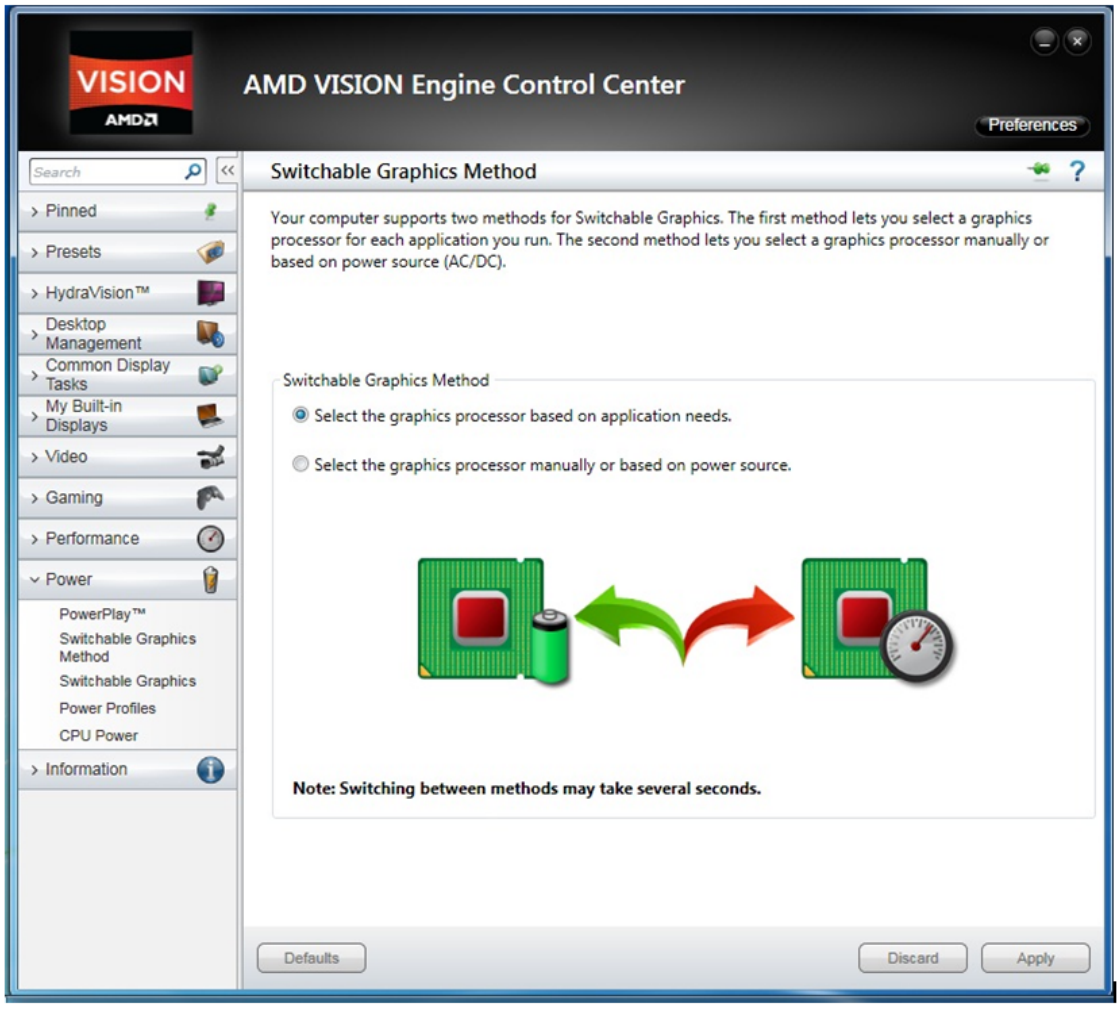

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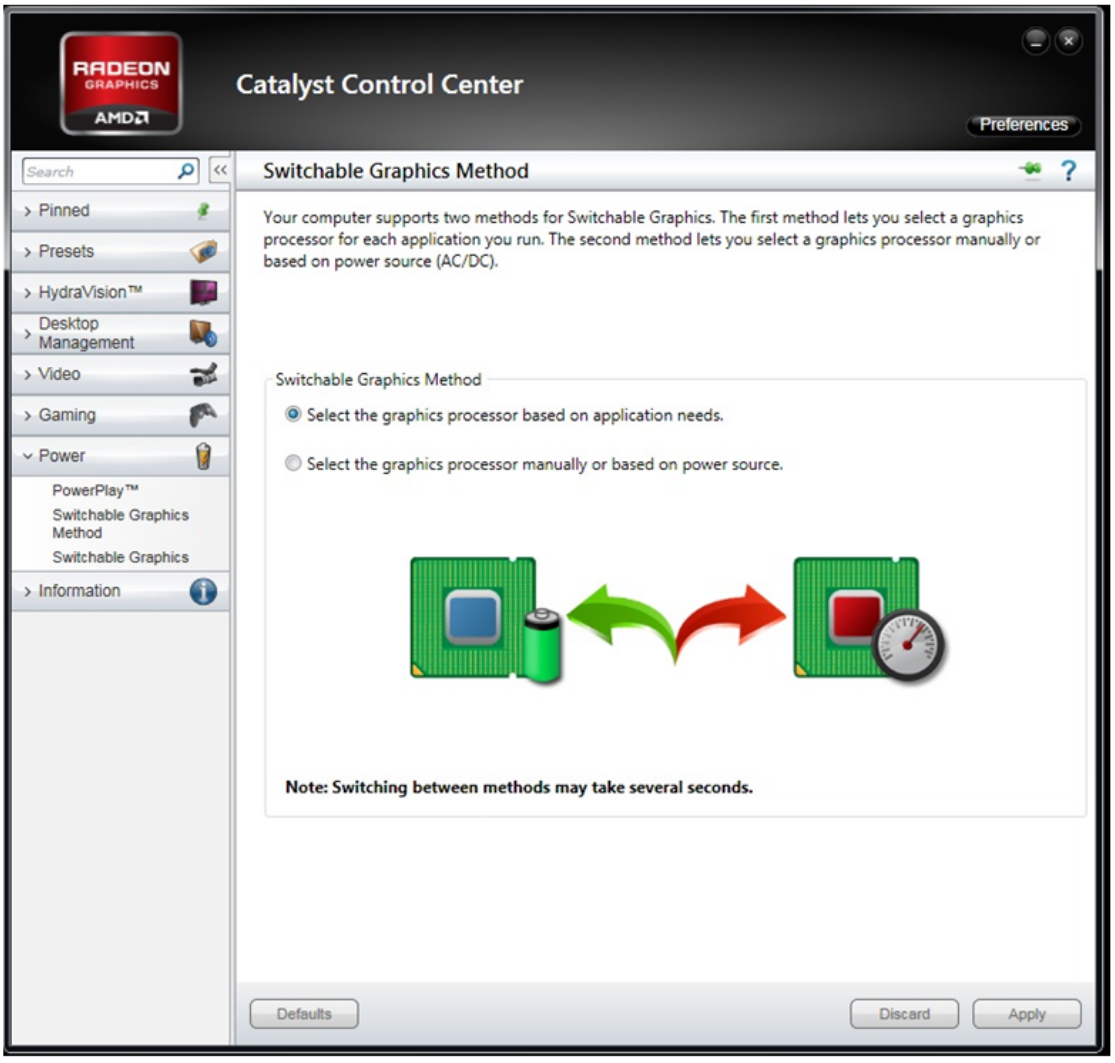
Figure 3–4 Scheme Switch UI on Intel Platforms



3.2.5.2 Fixed Scheme UI

On designs where the fixed scheme is supported, the user can select an active GPU from the fixed scheme UI found in Catalyst Control Center as shown in the following figures.

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Figure 3–5 Fixed Scheme UI on AMD Platforms

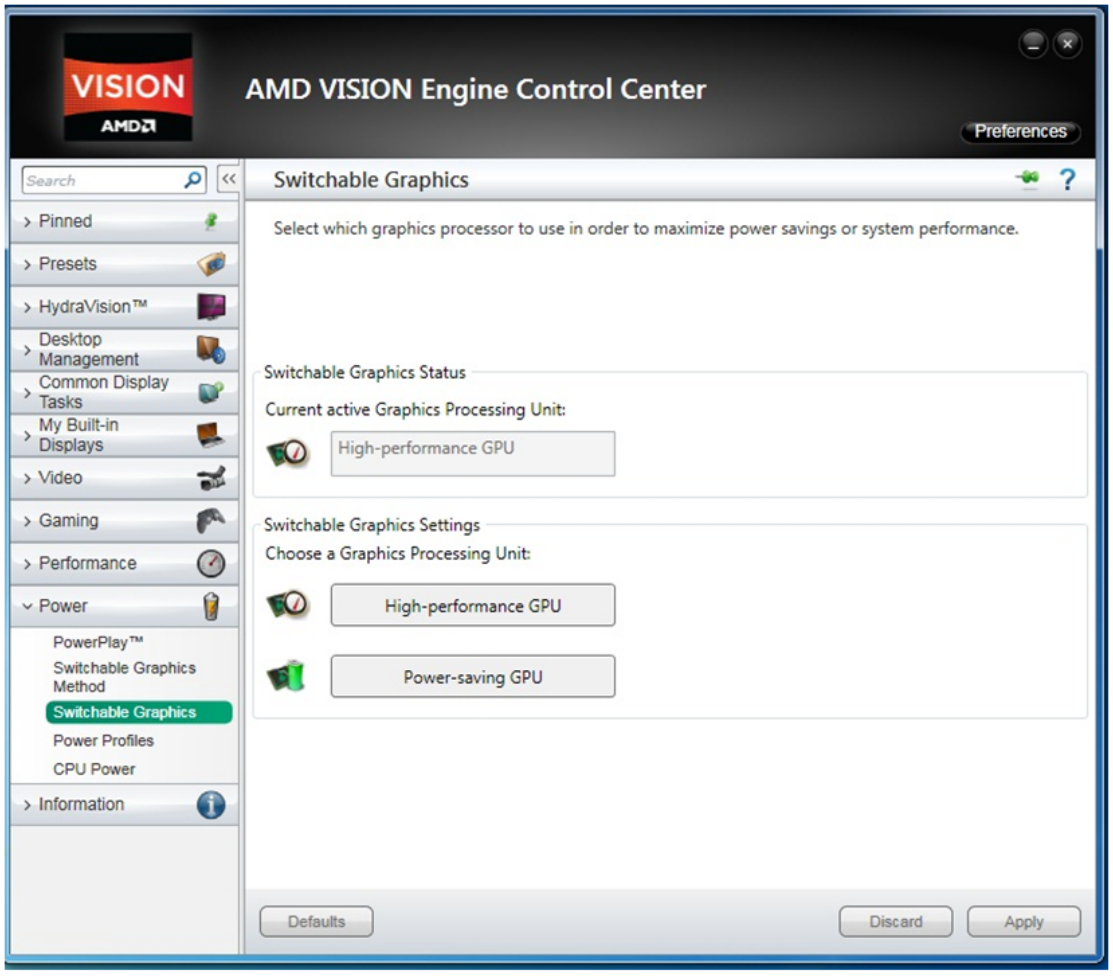

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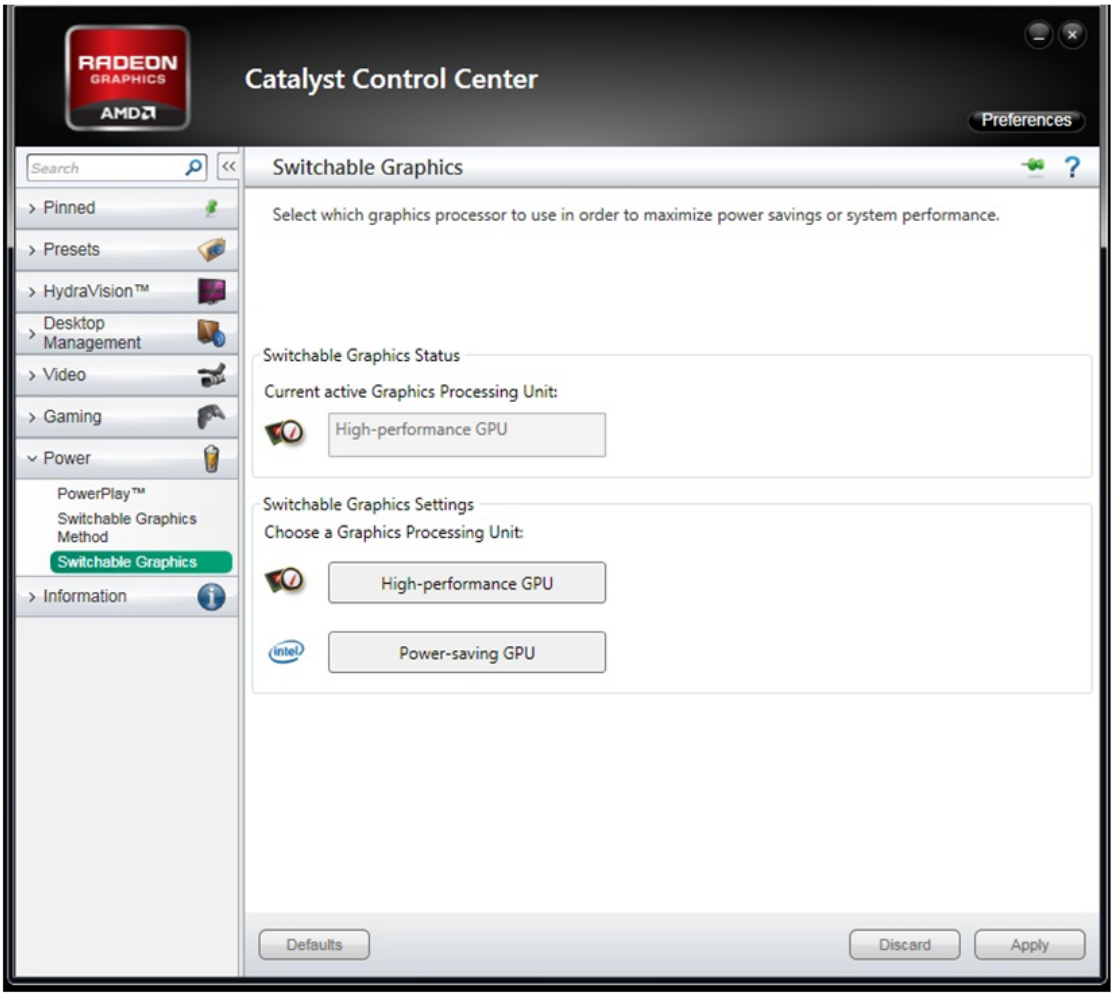
Figure 3–6 Fixed Scheme UI on Intel Platforms



An automatic GPU switch based on a system power source transition is configurable through the **Windows Power Plan—Advanced Settings** as shown in the following figure.

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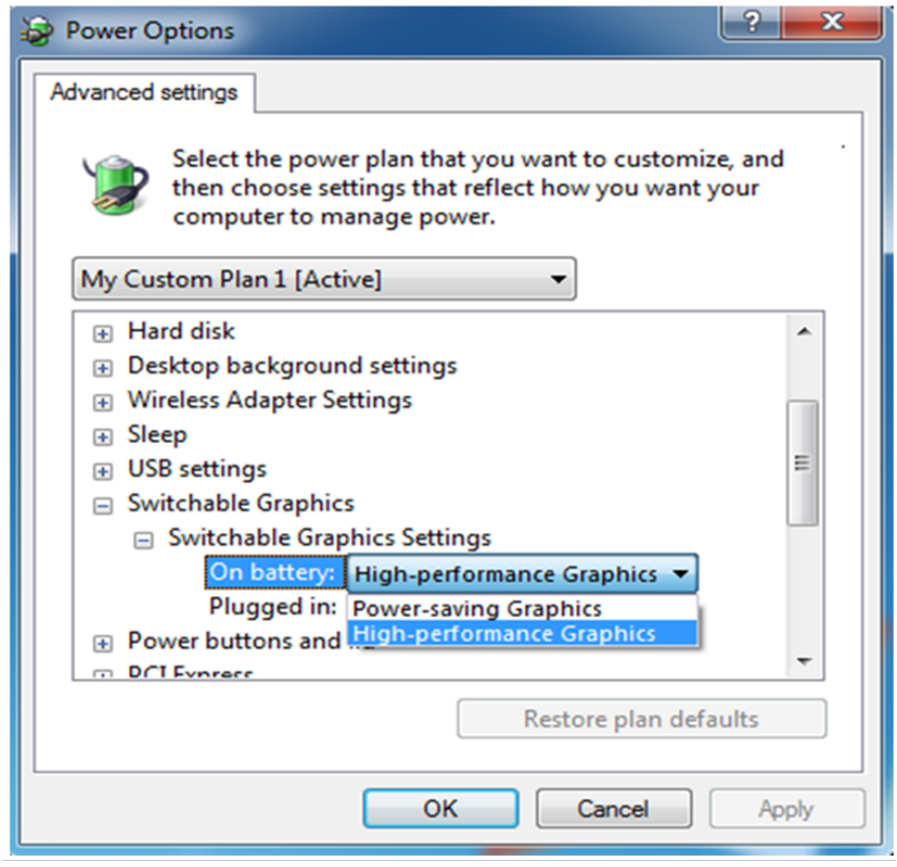
Figure 3–7 Switchable Graphics Power Options UI



The default settings are:

- Power Saving Plan: On Battery—Integrated Graphics, Plugged-in—Integrated Graphics
- Balanced Plan: On Battery—Integrated Graphics, Plugged-in—Discrete Graphics
- Performance Plan: On Battery—Discrete Graphics, Plugged-in—Discrete Graphics

3.2.5.3 Dynamic Scheme UI

On designs where the dynamic scheme is supported, an application profile add/update capability will be provided to allow users to select (on a per application basis) whether a Direct 3D/OpenGL application or video player should start on the fGPU/iGPU or dGPU. Users will be able to set up such a profile by selecting the application executable file from a list of most recently used applications or by browsing through the file directory.

Although user profile settings are retained through system reboots, the list of recently run applications will be lost with each reboot.

The following figures are examples of application profile updates.

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Figure 3–8 Example of Application Profile Update on AMD platforms

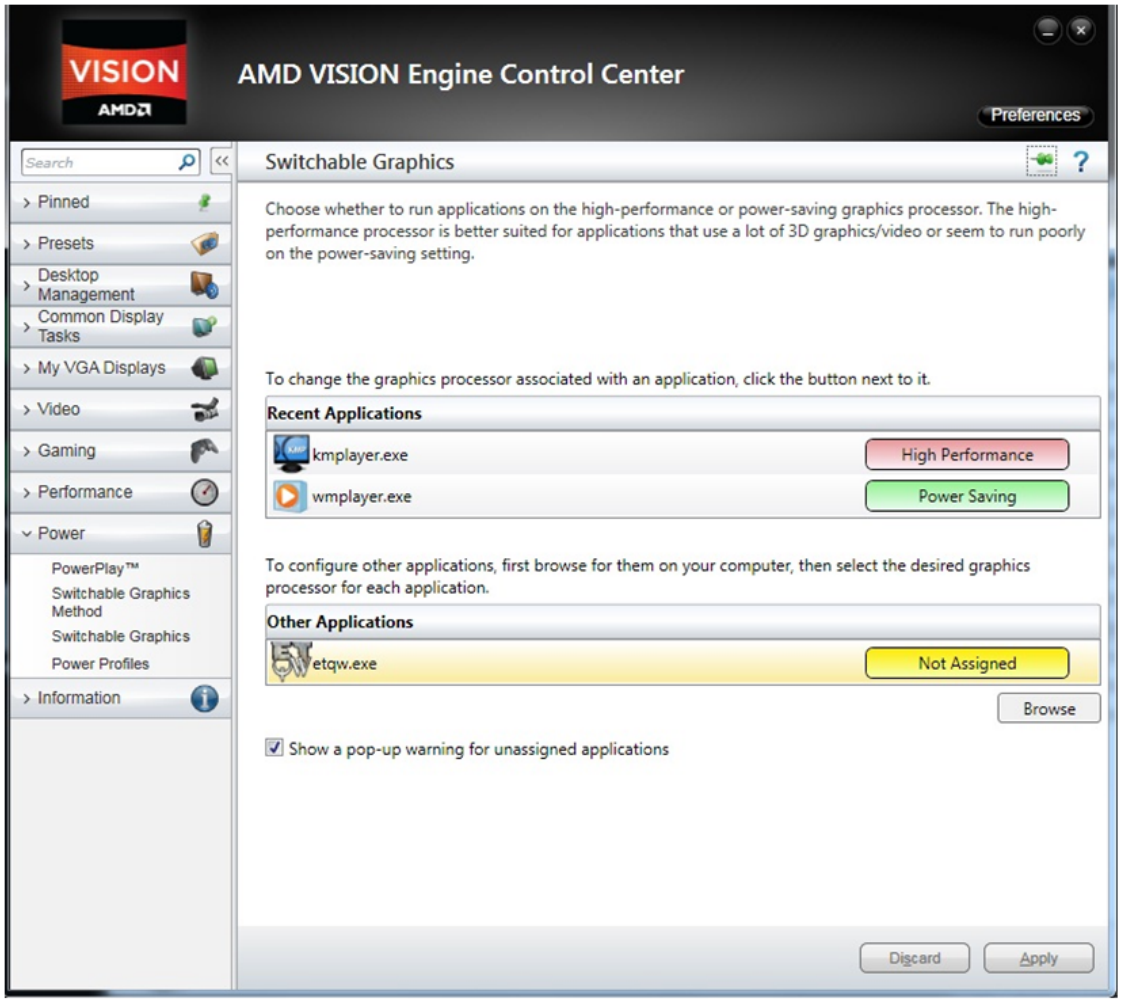

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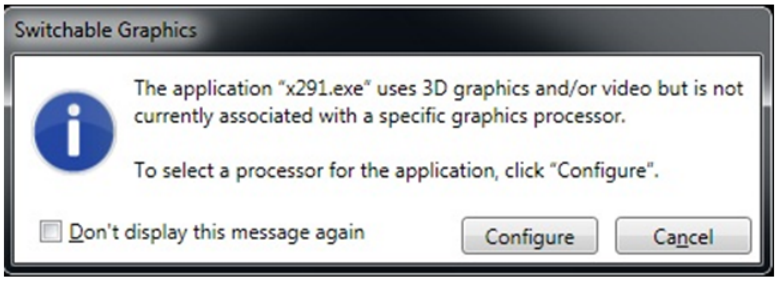
Figure 3–9 Example of Application Profile Update on Intel platforms

When an unknown application is executed for the first time, an optional dialog box will be displayed as shown in the following figure.

Figure 3–10 Example of Application Profile Update UI Pop-up Message


Switchable Graphics
The application "x291.exe" uses 3D graphics and/or video but is not currently associated with a specific graphics processor.
To select a processor for the application, click "Configure".
Don't display this message again
Configure
Cancel

The dialog box can be disabled by OEM customization in the AMD driver package.

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